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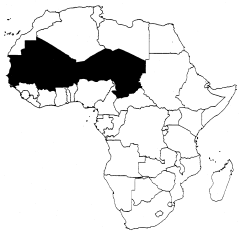

USAID/Mali and
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AGRICULTURAL DEVELOPMENT AND CHILD NUTRITION: WHAT DO WE KNOW?

by

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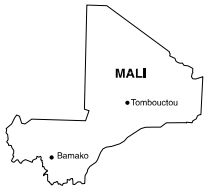

Malian institutions

Food Security II Cooperative Agreement between U.S. Agency for International Development, Global Bureau, Economic Growth and Agricultural Development Center, Office of Agriculture and Food Security and Department of Agricultural Economics, Michigan State University

BACKGROUND: Although Mali has experienced moderate economic and agricultural growth over the past decade, rates of child malnutrition remain alarmingly high. Results from the 1995-96 Demographic and Health Survey in Mali (DHS II) classify 30% of the children in the study as **stunted** and 23% as **wasted**[1].

OBJECTIVES: The objectives of this policy synthesis are to: (1) review the key biological and social factors that underlie poor health and nutrition in children; (2) address the potential effects of agricultural development on these underlying determinants; and (3) relate these findings to conditions in Mali, where policy makers are deeply concerned about the levels of childhood malnutrition revealed by recent studies, such as the DHS II. Specifically, this synthesis highlights important findings in developing countries on the relationship between child malnutrition and

- Child care, maternal education and feeding practices;
- Household income, food expenditures and consumption;
- Intra-household resource allocation; and
- Seasonal factors.

FINDINGS: Evidence from previous studies indicates that increasing income through agricultural commercialization is a necessary but not sufficient condition for improving child health and nutrition. Specifically, these studies suggest

- Agricultural commercialization is associated with higher incomes;
- Higher incomes do lead to greater expenditures on food, particularly for more expensive items like meats;
- Higher and more diversified incomes are associated with less seasonal insecurity;
- The effects of higher income on better health and nutrition for children are small;

[1]**Wasted** and **stunted** are defined as Z scores (anthropometric measurements) for children 2 or more standard deviations below the reference median. The World Health Organization Technical Expert Committee reports that genetic differences account for only 1 cm variation in height among 5 year old children in well-nourished populations (WHO 1995).

- Disease and sanitary conditions are important determinants of nutritional status;
- Seasonal work patterns may also affect child nutrition; and
- Who in the household controls resources does matter, although the effects of raising income outweigh changes caused by control over cash incomes.

Understanding Malnutrition: Malnutrition is the direct result of inadequate dietary intake, the presence of disease, or the interaction of these two factors (WHO 1995). The body assigns higher priority to the maintenance of vital functions other than growth; consequently, growth retardation results from various factors that threaten the child's health.

The risk of dying from a disease is twice as high for mildly malnourished children, five times as high for moderately malnourished, and eight times greater for children classified as severely malnourished (UNICEF 1996). Vitamin A deficiency alone will increase the risk of death from measles and diarrhea by 33% to 50%. The result of growth retardation is smaller adult body size, which reduces the body's capacity to work – of particular significance for agrarian societies. Severe malnutrition is also associated with retarded physical and mental development.

The two most commonly used anthropometric indices of malnutrition are weight-for-height (WHZ) and height-for-age (HAZ). Low weight-for-height, also referred to as **wasting**, is a short run or immediate indicator of malnutrition. Small height-for-age, or **stunting**, is a more medium-term proxy for poor nutrition. These anthropometric indices are accepted as good indicators of overall health.

Biological and Social Determinants: The process of **weaning** a child, from the introduction of solid foods to the end of breast feeding, is a critical element in determining the child's nutritional status. UNICEF recommends that all infants be exclusively breast-fed until approximately 6 months of age, when solid foods, in addition to breast milk, are introduced. Growth faltering is associated with:

- The quantity, quality and timing of solid foods and liquids introduced in the diet; and
- The amount, timing and duration of supplemental breast-feeding.

There is strong evidence throughout the world that **maternal education** is associated with lower levels of child mortality. Yet, traditional nutrition education programs have often been ineffective, primarily because their content is too theoretical, the use of food groups is out of context, and the suggestions are not economically feasible for the household. In Mali, only 16% of the women surveyed in the DHS II had some (formal) education.

Birth intervals and the mother's age are also important determinants of child mal-nutrition. Shorter intervals between children increase mortality and growth faltering for both younger and older siblings, through prenatal growth retardation and early termination of breast feeding. The children of young and older women are more likely to suffer from prenatal growth retardation and higher mortality.

Water-borne illnesses, such as cholera, typhoid fever, malaria and diarrhea, are responsible for 35 percent of all deaths of young children in Africa, Asia and Latin America. Evidence also shows that clean **water and better sanitation** are associated with lower rates of child mortality, morbidity and better nutrition.

- 76% of households surveyed in Mali (DHSII) have traditional pit toilets.
- Only 44% access water from wells.

Unsynchronized patterns of **interaction between the care giver and the child** in the early stages of development contribute to higher rates of growth retardation and sub-optimal behavioral development, which can be further

complicated by maternal work outside the home. Child care in developing countries is often performed by young siblings.

Agriculture and Malnutrition: According to Mebrahtu, Pelletier, and Andersen (1995), agricultural development can affect health and nutrition through the following pathways:

- Changes in (and access to) income;
- Food prices and price variability;
- Labor allocation, especially for the primary care giver;
- Energy and nutrient expenditures;
- Changes in the nutrient composition of foods, through the introduction of new crops and crop varieties; and
- Exposure to disease caused by changes in the environment associated with input use, technological change and resettlement or other rural projects.

Household Income, Food Expenditures and Consumption: Table 1 presents per capita consumption of various food items for Malian households by region, the percentage of the total budget spent on food, and the average weight-for-height and height-for-age Z scores for children ages 3 to 35 months (DHS II). Households in the northern areas of Mali allocate a substantially greater portion of their budget to food than do households in the southern regions. It would appear that rural households, and particularly those in northern regions, are at greater risk of chronic food insecurity and hence malnutrition. However, households in these areas may have developed better coping strategies and may have a wider range of available options than their Southern counterparts (Steffen 1994).

Engel's Law states that as incomes increase, households devote a smaller percentage of their income to food. Bennet's Law adds that households switch from less to more expensive calorie consumption, such as from coarse grains to meats and fresh fruits and vegetables, as incomes rise. Increased caloric consumption at the household level is generally positively and significantly related to better nutrition in children. Von Braun and Kennedy's review of IFPRI studies on the links between agricultural commercialization and child health and nutrition, generally confirmed that higher incomes from cash-cropping led to better nutritional status but that the impact was small (1994).

A study of an irrigated rice production scheme in The Gambia finds that participation leads to higher incomes, which in turn leads to increased food consumption, particularly during the hungry season. A 10% increase in household calorie consumption is associated with a 2.3% improvement in weight-for-age Z scores, an overall indicator of health and nutrition.

However, other studies show much smaller improvements to child health and nutrition associated with higher incomes from agricultural development. A study from 1983-85 of an export vegetable project in Guatemala found a 38% increase in total expenditures – a good measure of income – for the project participants studied. Off-farm income did fall, but this decrease was more than offset by the rise in income from the project. However, **nutritional** effects were minimal. Children in the study area were somewhat less likely to be classified as **stunted** and **wasted**. However, the area under study is near to the capital and has relatively better infrastructure than more remote areas of the country. Consequently, it is not clear that children were better off as a result of the export vegetable program. One factor not evident is whether the variability in income has changed. Off-farm income is usually associated with less risk; relying more heavily on vegetable crops may expose these farmers to greater price risk.

Table 1. Annual Per Capita Consumption (kg.) of Selected Foods by Region and Child Z scores

Product:	Kayes	Koulikoro	Sikasso	Segou	Mopti	Timbuktu	Gao/Kidal	Bamako
Cereals (Total)	190.1	233.4	221.3	197.3	227.0	198.8	155.8	137.8
Millet	22.7	99.2	82.7	114.3	147.9	69.2	42.4	22.4
Sorghum	107.7	92.7	50.7	27.3	24.9	46.2	15.4	42.1
Rice	21.2	19.7	12.0	34.4	47.6	69.9	68.8	59.7
Maize	34.7	20.2	73.7	17.3	5.6	7.1	21.6	7.8
Legumes	22.0	10.0	4.8	13.1	3.8	0.7	0.6	9.0
Meat, Poultry & Fish	15.9	11.9	6.8	15.2	13.1	20.1	29.6	19.0
Fruits & Vegetables	31.0	26.1	20.0	20.0	14.2	15.6	8.5	37.1
Milk & Eggs	8.9	7.5	4.8	6.3	6.6	20.2	16.6	3.6
Food Share of Budget	64%	51%	54%	55%	66%	77%	76%	54%
WHZ (mean, DHS II)	-0.97	-1.09	-1.15	-1.05	-1.27	-1.44	-0.97	-1.14
HAZ (mean, DHS II)	-1.36	-1.30	-1.40	-1.30	-0.97	-1.22	-1.24	-0.65

Source: Enquete Budget-Consommation, 1988-89, Demographic and Health Survey, 1995-96.

A study of Kenya found no significant relationship between higher income and lower morbidity (rates of disease). Although sugarcane production in southwestern Kenya raised income for sugarcane farmers, these effects do not trickle down to improve the health of children. Similar results are found in a study of sugarcane production in the Philippines. Incomes rise for households participating in sugarcane production, but these changes in income do not result in better nutritional outcomes for children. Higher incomes do allow households to purchase more expensive calories, like meats, but children don't usually consume these foods.

Intra-Household Resource Allocation: Studies of the intra-household distribution of food and other resources often show that age and gender affect how these resources are distributed among family. Customs surrounding the process of weaning also foster malnutrition. In a study of Mali by Dettwyler (1991), the cultural norm assumes that children know how hungry they are; consequently, food is not forced upon them.

Potato production in Rwanda shows two effects of agricultural commercialization on calorie consumption. First, there is a small negative affect of commercialization on consumption, which the researchers suggest is due to increasing men's control over income. Second, there is a larger, positive effect of income on consumption outweighing the decrease resulting from changing control over resources. The study concludes that child health and nutrition are largely related to health and sanitary conditions. Potato production did lead to higher incomes and, for food deficit households, this resulted in an increase in calorie consumption. The increase in calorie consumption did have a positive, albeit small, affect on child WHZ and HAZ scores (von Braun and Kennedy 1994).

Sahn (1990), studying child nutrition in Côte d'Ivoire, examines the effects of land holdings and various socio-economic factors on Z scores. The study finds no statistical relationship between HAZ and the amount of land per capita or the amount of land devoted to cash crop production. However, there is a negative and statistically significant relationship between land per capita and WHZ, the short-run measure of nutrition.

The study suggests two possibilities for this result. First, that more land per capita requires

greater participation from women, which may reduce the amount of time spent caring for children. Second, after controlling for income, households with more land per capita may receive a larger share of their income from agriculture. The larger percentage of income from agriculture may expose these households to more risk and greater variation in income.

Seasonal Factors: Increased labor requirements by women during peak agricultural work seasons can have adverse consequences; women may devote less time to care giving activities and food preparation, or delegate these responsibilities to younger women in the family. One result may be to diminish frequency, taste and nutrient quality of the food prepared.

Working during pregnancy can also have serious implications. Low-birth-weight babies (LBW), less than 2.5 kilograms, have higher rates of morbidity and mortality, and are more likely to suffer from stunting and other illnesses. Growth retardation is most severe when the mother works away from home during the last trimester of pregnancy.

- LBW babies are likely to result from maternal malnutrition during pregnancy.
- LBW children score lower on developmental tests.
- 24% of the children with known birth-weights in Mali (DHS II) were LBW.

Weight-for-height Z scores were substantially lower for children during the weeding season in a study of the effects of technological change of maize in Zambia. Although height-for-age, the longer-term indicator of nutrition, is consistently poor for children under 5, WHZ, an indicator of immediate nutritional status, is worse during the month of February (the study measured nutrition at four different times of the year). Women provide 67% of the labor for weeding (the predominant activity during February) in areas where hybrid maize is being cultivated (Kumar and Siandwazi 1994).

A study of maize and tobacco commercialization in Malawi (Peters and Herrera 1994) finds strong seasonal influences. The researchers attribute this influence not only to the hard work that occurs, but also to shortages of food as household stocks are depleted leading up to the harvest and to higher rates of disease occurring during this period[2]. Many of the nutritional differences between food secure and insecure households are not observed after the harvest.

POLICY IMPLICATIONS: Agricultural development is a necessary but insufficient condition for improving health and nutritional outcomes in children. Consequently, policy makers may wish to address the design of agricultural programs in order to improve malnutrition. For example, development projects can be coordinated to complement commercialization by channeling some of the profits to building infrastructure. More specifically, these monies could be used to improve sanitary conditions or increase access to health care.

The complexity of the relationship between agriculture and child malnutrition also underscores the need for comprehensive household-level data to explore and test hypotheses concerning these behaviors. Many of the studies cited earlier involved extensive research, although the ultimate objective may not have been to address child health and nutrition. Further research is necessary in order to better understand and recommend specific

[2] There is a degree of circularity: higher incidence of disease and illness may be caused, in part, by greater energy expenditures for work and reduced food intake which will then reduce the body's ability to process nutrients, further increasing susceptibility.

policy interventions that would target key factors influencing child development.

However, future research must be a coordinated endeavor in order for researchers to better inform policy makers. Studies such as the DHS II provide data on the incidence of child malnutrition, but little useful information on underlying causes. Others studies examine feeding practices, yet do an inadequate job of controlling for socio-economic conditions. Agricultural data provide information on resources and food availability at the household, but offers limited insight into how those resources and food are distributed among family members. Using common sampling frames across studies, which would permit pooling of data from the different studies, is perhaps the most efficient method of gathering the broad range of information necessary to better understand the causes of child malnutrition.

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